Data and Electronic Records Management Best Practices

Technology Standards

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Developed by the ACE Data and Electronic Records Management Domain
under the auspices of the Texas Department of Information Resources

Contents

Introduction

This guide is a tool to help state agencies and institutions of higher education manage their data and electronic records effectively. It identifies national and international standards published by recognized standards organizations that are used with and by automated information management systems. Computer-based systems that organize, maintain, and retrieve data and electronic records have evolved from point solutions in the mid-1980s to integrated, enterprise-wide applications. Best practices suggest that a greater benefit is received from implementing standards-based products and processes. Agencies should carefully plan and assess their requirements for data and electronic records management to help them identify appropriate solutions. Rules for managing electronic records and the data that support them are located in the *Electronic Records Standards and Procedures*, administrative rules of the Texas State Library and Archives Commission.[1]

Scope and Audience

State records in all formats must be properly managed to support business needs and meet accountability obligations. Electronic state records and the data that support them are subject to the same legal requirements as records on paper or in any other format. Electronic records include those created in an electronic format (born digital) and those converted into an electronic format (e.g., imaged documents).

Why Use Standards

Technical standards provide the infrastructure that makes information systems and databases less expensive to develop, easier to use, and universal in value. Standards can be vehicles that allow agencies and institutions of higher education to move through periods of transition. It will be increasingly important that standards such as common indexing systems, common identifiers, and common coding systems be put in place so Texas can capitalize on its technology investment. The best standards evolve over time and respond to changes in the industry. They must reflect real needs and solve real problems or they will not be used.

Standards-based technology eases application integration, provides for reuse of components, and maintains adaptability in the face of changing organizations and technology.

Using the Guide

This guide describes standards pertaining to data and electronic records management that have been published by nationally and internationally recognized standards-setting organizations. The listing is not intended to be exhaustive, but reflects standards in general use at the time of compilation (January 2005).

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[1] 13 TAC 1, §§ 6.91–6.97 (Texas State Library and Archives Commission). Retrieved 26-Sep-2005, from the *Secretary of State* at <http://info.sos.state.tx.us/pls/pub/readtac$ext.viewtac>.

Agencies and institutions of higher education should review published standards when considering data and electronic records management solutions. Adhering to products compliant with published standards is considered an industry best practice. Because there are a large number of complementary and competing standards that describe the architecture of data and electronic records management systems, these guidelines provide no specific recommendations, but are intended only to be advisory in nature.

The standards are listed under disciplines identified by the Data and Electronic Records Management Domain. Information about the various standards-setting bodies can be found in Appendix A.

A short description of automated data and electronic records management tools can be found in Appendix B.

Standards

Managing Data and Electronic Records

These standards apply to the complete life cycle of data and electronic records management.

- **DoD 5015.2-STD** – Design Criteria Standard for Electronic Records Management Software Applications, 6/19/2002

  This standard sets forth mandatory baseline functional requirements for Records Management Application (RMA) software used by components of the Department of Defense to implement their records management programs. It defines required system interfaces and search criteria to be supported by the RMAs and describes the minimum records management requirements that must be met, based on current National Archives and Records Administration (NARA) regulations. It was issued under the authority of the DoD Directive 5015.2, "Department of Defense Records Management Program," March 6, 2000, that provides implementation and procedural guidance on the management of records in the Department of Defense. See <http://www.dtic.mil/whs/directives/corres/pdf/50152std_061902/p50152s.pdf>.

  The standard's requirements assure that basic capabilities exist to
  - Define a file plan of record series and their associated disposition schedules
  - Identify and declare records and provide context
  - Store, preserve, and protect electronic records
  - Search for and retrieve electronic records
  - Track records' disposition schedule status
  - Execute disposition instructions-cutoff, transfer, and destroy

- **ANSI/AIIM/ARMA TR48-2004** – Framework for Integration of Electronic Document Management Systems and Electronic Records Management Systems

  This technical report provides a framework for the integration of Electronic Document Management Systems (EDMS) and Electronic Records Management Systems (ERMS). The report deals with what is required for EDMS and ERMS to integrate and interoperate.

- **ISO 15489-1:2001** – Information and documentation / Records management / Part 1: General

  This part of the ISO 15489 standard provides guidance on managing records of originating organizations, public or private, for internal and external clients. All the elements outlined in this part of ISO 15489 are recommended to ensure that adequate records are created, captured and managed. Procedures that help to ensure the management of records according to the principles and elements outlined in this part of ISO 15489 are provided in ISO/TR 15489-2 (Guidelines).

- **ISO 15489.2-2002** – Records management / Part 2: Guidelines

  This part of the ISO 15489 standard provides guidelines that are supplementary to ISO 15489.1 that apply to records in any format or media, created, or received by any public or private organization during the course of its activities.

- **ISO 23081.1-2004** – Information and documentation / Records management processes / Metadata for records / Principles

  This standard proposes the adoption of ISO 23081-1-2004, which covers the principles that underpin and govern records management metadata.

- **ANSI/ARMA 9-2004** – Requirements for Managing Electronic Messages as Records

  This publication defines requirements for developing a corporate policy for managing information content in any type of text-based electronic message or communication such as e-mail or instant messaging. It also includes recommended provisions for an electronic message records management policy useful throughout the life cycle from message creation to final destruction or disposition. This standard addresses the managerial issues surrounding the creation, maintenance, and disposition of e-mail messages within the context of a formal records management program and is expected to be a valuable resource for anyone responsible for managing e-mail and other electronic messages.

- **ARP1-2002** – Implementation Guidelines and Standards Associated with Web-based Document Management Technologies

  This publication presents a set of procedures and activities, which should be considered and/or performed during implementation of an Internet/intranet document management based technology. It outlines specific recommended activities to be completed throughout the various project phases typically performed during implementation. Technical reports, guidelines, and standards developed for technologies commonly used in document management systems are included for users. See <http://www.project-consult.net/Files/AIIM+ARP1+2002.pdf>.

Creating Data and Electronic Records

These standards apply, but are not limited, to the creation of data and electronic records.

- **ANSI/IEEE 830-1998** – Recommended Practice for Software Requirements Specifications

  This specification describes the content and qualities of a good software requirements specification (SRS) and presents several sample SRS outlines. This recommended practice is aimed at specifying requirements of software to be developed but also can be applied to assist in the selection of in-house and commercial software products. Guidelines for compliance with IEEE/EIA 12207.1-1997 are also provided.

- **IEEE 1233-1998 Edition (R2002)** – IEEE Guide for Developing System Requirements Specifications (including IEEE 1233a)

  This standard provides guidance on the development of the set of requirements, Systems Requirements Specification (SyRS) that will satisfy an expressed need. Developing an SyRS includes the identification, organization, presentation, and modification of the requirements. Also addressed are the conditions for incorporating operational concepts, design constraints, and design configuration requirements in the specification. This guide also covers the necessary characteristics and qualities of individual requirements as well as the set of all requirements.

- **ANSI/AIIM MS44-1988 (R1993)** – Recommended Practice for Quality Control of Image Scanners

  This standard defines procedures for the ongoing control of quality within an electronic image management system from input through output. Regular use of these procedures should ensure that the established level of quality is maintained.

- **ANSI/AIIM MS52-1991** – Recommended Practice for the Requirements & Characteristics of Original Documents Intended for Optical Scanning

  This standard describes the physical characteristics of original documents that will facilitate scanning of the documents. It also identifies those characteristics that will make scanning difficult or impossible. It also makes recommendations for designing documents in order to make those documents easier to scan.

- **ANSI/AIIM MS55-1994** – Recommended Practice for the Identification and Indexing of Page Components (Zones) for Automated Processing in an EIM Environment

  This standard identifies a media and application independent structure and indexing scheme of document pages and zones within a page. It includes an exact description of the data elements that should be used to implement a zone definition record as a Standard Recommended Practice.

- **ANSI/AIIM MS61-1996** – Application Programming Interface (API) for Scanners in Document Imaging Systems

  This standard provides a common programming interface between device dependent software and document image scanners. It also explains how to provide uniform access to the typical design features of document scanners and to specific features that individual manufacturers may provide.

- **ANSI/AIIM TR15-1997** – Planning Considerations, Addressing Preparation of Documents for Image Capture

  This technical report addresses the preparation of paper documents and microforms for image capture. It provides planning information to organizations considering image

capture as a means of converting an existing record collection. It covers the physical preparation of documents for image capturing systems.

- **ANSI/AIIM TR27-1996** – Electronic Imaging Request for Proposal (RFP) Guidelines

  This technical report provides step-by-step procedures for analyzing system requirements, developing functional specifications, and evaluating configuration needs. It focuses on imaging systems for office-type documents.

- **ANSI/AIIM TR32-1994** – Paper Forms Design Optimization for Electronic Image Management (EIM)

  This technical report provides guidelines for the design and creation of printed-paper forms to be filled out and returned by users and scanned for processing by EIM systems. It describes how to minimize the costs of EIM forms processing by choosing the appropriate scanning technology and form designs.

- **ANSI/AIIM TR40-1995** – Suggested Index Fields for Documents in Electronic Image (EIM) Environments

  This technical report provides sample index fields for processing and retrieving information captured for use with EIM systems. The indexing fields can be used for search, retrieval, query, processing, routing, queuing (workflow), and maintenance (backup and purging).

Defining/Appraising/Classifying Data and Electronic Records

These standards apply, but are not limited, to defining, appraising, and classifying data and electronic records

- **ANSI/NISO Z39.85-2001** – Dublin Core Metadata Element Set

  This standard defines fifteen metadata elements for resource description in a cross-disciplinary information environment. Metadata is structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource. This standard supersedes Internet RFC 2413, which was the first published version of the Dublin Core. See <http://www.niso.org/standards/resources/Z39-85.pdf>.

Maintaining Data and Electronic Records

These standards apply, but are not limited, to maintaining data and electronic records so that they remain auditable, authentic, and reliable.

- **ANSI/AIIM TR35-1995** – Human & Organizational Issues for Successful EIM System Implementation

  This technical report provides a fundamental framework for understanding the basic issues and concepts of organizational factors, human factors, and ergonomics for

Electronic Image Management (EIM) systems. It focuses on cognitive, physical, organizational, and human factors as technologies.

- **WfMC-TC-1003, v1.1 (Jan95)** – Workflow Reference Model

  This reference model describes the workflow system architecture.

- **WfMC-TC-1009, v2 (Jul98)** – Workflow Client API Specifications (WAPI)

  This specification defines application-programming interfaces for process, activity, work list, and process definition workflow operations.

- **WfMC-TC-1012, v2 (Dec99)** – Workflow Interoperability / Abstract Specification

  This specification defines logical message sequences and contents for interoperating workflow with other systems.

- **Federal Information Processing Standards Publication 112 – Password Usage**

  This standard specifies basic security criteria for two different uses of passwords in an automated data processing (ADP) system, (1) personal identity authentication and (2) data access authorization. It establishes the basic criteria for the design, implementation, and use of a password system in those systems where passwords are used. It identifies fundamental ADP management functions pertaining to passwords and specifies some user actions required to satisfy these functions. In addition, it specifies several technical features, which may be implemented in an ADP system in order to support a password system. An implementation schedule is established for compliance with the Standard. Numerous guidelines are provided in the Appendices for managers and users seeking to comply with the Standard. See <http://www.itl.nist.gov/fipspubs/fip112.htm>.

Storing Data and Electronic Records

These standards apply, but are not limited, to storing data and electronic records in appropriate formats, media, and storage systems.

- **ANSI/AIIM MS53-1993** – Recommended Practice; File Format for Storage & Exchange of Image; BiLevel Image File Format

  The standard describes a self-contained file format for bi-level image file transfer in non-facsimile environments. It specifies a file format for exchanging bi-level electronic images coded using CCITT Recommendations T.4 and T.6, (Group 3) plus bit-mapped images that have no compression.

- **DMA 1.0 (1997)** – Document Management Alliance Specification

  This document defines an architecture and object model to enable interoperability between document management applications and systems. It allows for interoperability

across different proprietary document management systems (DMS) regardless of the platforms on which they reside and regardless of the networks in which they exist, and without requiring clients to have advance intimate DMS knowledge. The goal is to have uniform access to any document stored in any format, anywhere, at any time.

- **ODMA 2.0 (1997)** – Open Document Management API

  This document specifies the application-programming interface for desktop applications to use when integrating with document-management systems. ODMA is an industry-lead effort to ease cross-platform and cross-application communication by standardizing access to document management clients through a published Application Programming Interface (API). The ODMA API allows applications (word processors, spreadsheets) to communicate with a DMS in a flexible manner without the need of a hard-coded link between the application and the DMS. Thus, ODMA allows multiple applications to access the same DMS.

- **ANSI/AIIM TR21-1991** – Recommendations for the Identifying Information to be Placed on Write-Once-Read-Many (WORM) and Rewritable Optical Disk (OD) Cartridge Label(S) and Optical Disk Cartridge Packaging (Shipping Containers)

  This technical report describes information that should be placed on a physical label or other printed surface to identify optical disk cartridges and optical disk cartridge types.

- **ANSI/INCITS 388-2004** – Information Technology / Storage Management / Development work Conducted in Storage Network Industry Association

  This specification documents a secure and reliable interface that allows storage management systems to identify, classify, monitor, and control physical and logical resources in a Storage Area Network (SAN). Although the standard currently focuses on storage management of SANs, it will be extended to include Network Attached Storage (NAS), Internet Small Computer System Interface (iSCSI) and other storage networking technologies. The SNIA's Storage Management Initiative (SMI) was created by the Storage Management Networking Industry Association (SNIA) to develop and standardize interoperable storage management technologies and aggressively promote them to the storage, networking and end user communities. SMI-S is based on the Web Based Enterprise Management (WBEM) architecture and the Common Information Model (CIM), and pioneered by the Distributed Management Task Force (DMTF).

- **IEEE 828-1998** – Standard for Software Configuration Management Plans

  This standard establishes the minimum required contents of a software configuration management plan (SCMP). It defines the specific activities to be addressed and their requirements for any portion of a software product's life cycle. The plan specifies procedures for storing documents and magnetic media and includes information about physical marking and labeling. It may also describe procedures for data retention periods and disaster prevention and recovery.

Accessing Data and Electronic Records

These standards apply, but are not limited, to accessing data and electronic records.

- **ANSI/NISO Z39.50-2003** – Information Retrieval: Application Service Definition & Protocol Specification

  This standard defines a client/server based service and protocol for information retrieval. It specifies procedures and formats for a client to search a database provided by a server, retrieve database records, and perform related information retrieval functions. The protocol addresses communication between information retrieval applications at the client and server; it does not address interaction between the client and the end-user.

- **ANSI/AIIM TR33-1998** – Selecting an Appropriate Image Compression Method to Match User Requirements

  This technical report provides practical methods for selecting an appropriate and optimal image compression scheme to match user requirements. It addresses some of the applications of image compression methods and standards that are used for continuous tone (color and gray scale) images and for bi-level (line art and text) images. See the World Wide Web Consortium Web site (www.w3c.org) for key Web-related standards such as XML.

Disposing of Data and Electronic Records

These standards apply, but are not limited, to the disposition of data and electronic records.

- **ANSI/AIIM TR25-1995** – The Use of Optical Disks for Public Records

  This technical report provides guidelines for the planning, implementation, and operation of optical disk systems in applications involving long-term and permanent public records.

- **ANSI/AIIM TR31 (R1999)** – Performance Guideline for the Legal Acceptance of Records Produced by Information Technology Systems

  This technical report consists of four-parts and provides an overview of laws relevant to recordkeeping, guidance for legal acceptance criteria. It also provides a systematic approach to implement compliant recordkeeping practices.

- **ANSI/AIIM TR28-1991** – The Expungement of Information Recorded on Optical Write-Once-Read-Many (WORM) Systems

  This technical report provides uniform procedures for the removal of information recorded on WORM disk media in response to court orders.

- **ISO 14721:2002** – Reference model for an open archival information system (OAIS)

  This standard, awaiting publication, is a comprehensive logical model describing all of the functions of a digital repository. It outlines how digital objects can be prepared, submitted

to an archive, stored for long periods, maintained, and retrieved as needed—without addressing specific technologies or archiving techniques. The model also establishes common terms, concepts, and significant relationships. While the model does not go into specific requirements, it does identify the recommended processes and metadata necessary to preserve and make digital information available.

- Document Management / Long-term electronic preservation / Use of PDF (PDF-A) (ISO standard in development)

  This standard is under development. It will define the use of the Portable Document Format (PDF) for archiving and preserving documents.

Appendix A: Standards Organizations

Standards are technical specifications or other criteria that a product, process or service must meet. They enhance safety, reliability, and performance of the products, processes, and services used by consumers. Use of standards gives agencies and institutions of higher education a greater choice of products, processes, or services.

To be credible, standards must have the following characteristics:

- The development process must be overseen by a recognized standards body.
- The development process must be open to participation by all interested parties.
- The resulting standards must be documented and made publicly available.
- A method for monitoring and verifying that organizations are complying with standards is developed.

When developing a standard, standards organizations must establish technical committees that represent all the important interests concerned with the standard. The members of these committees are generally volunteers, but many employees of industry or government may participate as part of their job. Decisions about standards are reached by consensus, which requires that all viewpoints be considered. In the common practice of standards-setting bodies, consensus means that all parties involved in the preparation of a standard must reach substantial agreement. Consensus includes an attempt to resolve all objections and implies much more than the concept of a simple majority, though not necessarily unanimity.

Once the committees have approved the standard, notices inviting public comment are posted. The average time needed to develop and approve a standard is 18 months.

Different types of commonly accepted standards are:

- **Official standard** – a standard that has been officially recognized by a standards-making organization through successfully balloting candidate documents.
- **Industry standard** – a standard that has been developed and published by an industry consortium.
- **De facto standard** – a standard that arises from industry wide acceptance of a method, a tool, a hardware implementation, or a protocol.

Agencies and institutions of higher education should be aware of organizations that develop standards for data and electronic records management products and processes. A comprehensive listing of all known standards can be found at the NSSN: A National Resource for Global Standards Web site (www.nssn.org).

The descriptions of standards organizations that follow were taken primarily from the Web sites of the organizations and generally reflect their own descriptions.

AIIM (Association for Information and Image Management)

AIIM is a professional organization focused on helping users to understand the challenges associated with managing documents, content, and business processes. AIIM is international in scope, independent, implementation-focused, and, as the representative of the entire ECM industry – including users, suppliers, and the channel – acts as the industry's intermediary. AIIM is the international authority on Enterprise Content Management (ECM) and the tools and technologies that capture, manage, store, preserve, and deliver content in support of business processes. AIIM Standards is comprised of twenty-plus committees and working groups. Two committees of note are the AIIM Document Management Alliance (http://www.infonuovo.com/dma) and the AIIM Open Document Management API (http://www.infonuovo.com/odma/). Over 80 of AIIM's standards, recommended practices, and technical reports (TR) have been drafted and approved by ANSI. In addition to technical reports, AIIM publishes AIIM Recommended Practices (ARP) and guidelines that cover a variety of topics related to selecting, implementing, and managing data and electronic records processes and systems. See <http://www.aiim.org>.

ANSI (American National Standards Institute)

ANSI is a private, non-profit organization that administers and coordinates the U.S. voluntary standardization and conformity assessment system. The Institute's mission is to enhance both the global competitiveness of U.S. business and the U.S. quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems, and safeguarding their integrity. Founded in 1918 by five engineering societies and three government agencies, the Institute remains a private, nonprofit membership organization supported by a diverse constituency of private and public sector organizations. The Institute represents the interests of its nearly 1,000 company, organization, government agency, institutional and international members through its office in New York City, and its headquarters in Washington, D.C. See <http://www.ansi.org/>.

ARMA International

ARMA International is an association of information management professionals. It is a not-for-profit association and a leading authority on managing records and information – paper and electronic. The association was established in 1956. Its 10,000-plus members include records managers, archivists, corporate librarians, imaging specialists, legal professionals, IT managers, consultants, and educators, all of whom work in a wide variety of industries, including government, legal, healthcare, financial services, and petroleum in the United States, Canada, and 30-plus other countries. The association also develops and publishes standards and guidelines related to records management. See <http://www.arma.org/>.

DoD (U.S. Department of Defense)

The DoD is the executive department of the federal government charged with coordinating and supervising all agencies and functions of the government relating directly to national security and military affairs. In 1993, the Office of the Secretary of Defense (OSD) recognized

that there was a growing requirement to manage electronic records, so DoD Records Management was included as part of a functional process improvement initiative. DoD created the groundwork for establishing a certification process and published *Baseline Requirements and Data Elements for DoD Records Management Application (RMA) Software* became DOD 5015.2-STD. A program for testing and evaluating records management software was developed. Currently, the Joint Interoperability Test Command (JITC) of the Defense Information Systems Agency (DISA) manages the compliance testing process for the DoD electronic records management standard. The Compliance Program verifies that the software of RMAs satisfies mandatory requirements. This testing is mandatory for DoD and endorsed by NARA for all Federal Agencies. See <http://jitc.fhu.disa.mil/recmgt>.

ICGI (US Federal Interagency Committee on Government Information)

The Interagency Committee on Government Information (ICGI) was created in June 2003 to implement Section 207 of the E-Government Act of 2002 (Public Law 107-347, 44 U.S.C. Ch. 36). The ICGI consists of an Executive Committee, comprised of representatives of NARA, the offices of the chief information officers (CIOs) of Federal agencies, and other relevant officers from the executive branch. Pursuant to the Act, the ICGI may also include representatives of the Federal legislative and judicial branches. The ICGI has an extensive agenda to draft recommendations and share effective practices for access to, dissemination of, and retention of federal government information. The ultimate goal is to make it easier for all Americans to find and use the government information and services they need. See <http://www.cio.gov/documents/icgi.html>.

IEEE (Institute of Electrical and Electronics Engineers)

The IEEE and its predecessors, the AIEE (American Institute of Electrical Engineers) and the IRE (Institute of Radio Engineers), date to 1884. From its earliest origins, the IEEE has advanced the theory and application of electro technology and allied sciences, served as a catalyst for technological innovation and supported the needs of its members through a wide variety of programs and services. See <http://www.ieee.org>.

INCITS (International Committee for Information Technology Standards)

INCITS is the primary U.S. focus of standardization in the field of Information and Communications Technology (ICT) encompassing storage, processing, transfer, display, management, organization, and retrieval of information. As such, INCITS also serves as the American National Standards Institute's (ANSI) Technical Advisory Group for ISO/IEC Joint Technical Committee 1. JTC 1 is responsible for International standardization in the field of information technology. INCITS is accredited by ANSI and operates under its rules, designed to ensure that voluntary standards are developed by the consensus of directly and materially affected interests. See <http://www.incits.org/>.

ISO (International Organization for Standardization)

ISO is the world's largest developer of standards. Although ISO's principal activity is the development of technical standards, ISO standards also have important economic and social repercussions. ISO is a network of the national standards institutes of 146 countries, on the basis of one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system. ISO is a non-governmental organization: its members are not delegations of national governments. See <http://www.iso.org>.

NARA (U. S. National Archives and Records Administration)

NARA was established by an act of Congress in 1934. Its purpose is to hold in trust the permanently valuable records of the Federal government for the use of citizens and scholars. The National Archives acquires, documents, preserves, and makes available for research records of enduring value created or received by all three branches of the federal government. It ensures continuing access to essential evidence that documents: (1) the rights of American citizens; (2) the actions of federal officials; (3) the national experience. NARA is also charged with providing federal agencies with guidance, through records-management regulations, to fulfill their statutory obligation to make and preserve records that contain adequate and appropriate documentation of the agency's business. The regulations are reviewed and updated periodically to reflect changing information technology and recordkeeping practices in agencies. See <http://www.archives.gov>.

NISO (National Information Standards Organization)

NISO is a non-profit association accredited by the American National Standards Institute (ANSI). It identifies, develops, maintains, and publishes technical standards to manage information in our changing and ever-more digital environment. NISO standards apply both traditional and new technologies to the full range of information-related needs, including retrieval, re-purposing, storage, metadata, and preservation. Founded in 1939, incorporated as a not-for-profit education association in 1983, and assuming its current name the following year, NISO draws its support from the communities it serves. The leaders of over 70 organizations in the fields of publishing, libraries, IT and media serve as its voting members. Hundreds of experts and practitioners serve on NISO committees and as officers of the association. NISO recognizes that standards must reflect global needs. Designated by ANSI to represent U.S. interests to the International Organization for Standardization's (ISO) Technical Committee 46 on Information and Documentation, NISO is well positioned to bring together all interested parties wherever they are based. See <http://www.niso.org>.

NIST (National Institute of Standards and Technology)

The NIST is a non-regulatory federal agency within the U.S. Commerce Department's Technology Administration. It was founded in 1901. The NIST's mission is to develop and promote measurement, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life. NIST employs about 3,000 scientists, engineers, technicians, and support and administrative personnel. About 1,800 guest researchers complement the

staff. In addition, NIST collaborates with 2,000 manufacturing specialists and staff at affiliated centers around the country. Because NIST is a non-regulatory agency, companies feel more comfortable sharing their concerns and technical needs with the agency's scientists and engineers. Companies often come to NIST to discuss agendas for the measurements and standards that they sorely need and that can be developed only at a national level. See <http://www.nist.gov/>.

OASIS (Organization for the Advancement of Structured Information Standards)

OASIS is a not-for-profit, international consortium that drives the development, convergence, and adoption of e-business standards. The consortium produces more Web services standards than any other organization along with standards for security, e-business, and standardization efforts in the public sector and for application-specific markets. Founded in 1993, OASIS has more than 4,000 participants representing over 600 organizations and individual members in 100 countries. See <http://www.oasis-open.org>.

SNIA (Storage Networking Industry Association)

The SNIA is a not-for-profit organization made up of more than 300 companies and individuals spanning virtually the entire storage industry. SNIA members share a common goal: to set the pace of the industry by advancing the adoption of storage networks as complete and trusted solutions. To this end, the SNIA is uniquely committed to delivering standards, education, and services that will propel open storage networking solutions into the broader market. See <www.snia.org>.

WfMC (Workflow Management Coalition)

The WFMC was, founded in August 1993. It is a non-profit, international organization of workflow vendors, users, analysts, and university/research groups. The Coalition's mission is to promote and develop the use of workflow through the establishment of standards for software terminology, interoperability, and connectivity between workflow products. Consisting of over 300 members worldwide, the Coalition is the primary standards body for this significant software market. See <http://www.wfmc.org/>.

Appendix B: Data And Electronic Records Management Software

The last quarter of a century has seen the introduction of technological solutions designed to enhance the management of data and electronic records. Initially, point solutions were developed to solve only specific problems. The first records management software applications were designed in the early to mid-1980s to automate management of paper-based records. Electronic document imaging applications, introduced in the mid-1980s, were designed to convert paper records to a digital format to replace paper and microfilm recordkeeping systems. In the late 1980s and early 1990s, electronic document management software applications were designed to manage electronic documents that were created in computing environments.

Within the last few years, technological solutions have converged into integrated products that manage the entire life cycle of data and electronic records. The current industry term used for these products is Enterprise Content Management (ECM). Document management solutions were designed primarily to provide the end user with accessibility to documents, not to manage the document life cycle. Within the last few years, legal compliance issues have brought a new level of interest to records management, especially to records in electronic form. Functionality to manage data and records from cradle to grave is being built into enterprise content management solutions.

Preserving electronic data and records of enduring value is crucial to maintaining government accountability and retaining Texas' cultural heritage. Because technical obsolescence and media decay pose a large threat to electronic information, technology solutions based on the Reference Model for an Open Archival Information System are being developed for long-term maintenance and continuing access.

Agencies and institutions of higher education should conduct a risk analysis to identify their own organizational needs for managing data and electronic records. They should also undertake policy development, strategic planning, and gain an understanding of their business processes. If a technology solution is considered, an agency must understand how the system will support enterprise business needs. Although point solutions may solve a specific problem, for long-term compliance, a product that manages all kinds of data and electronic records is generally recommended.

Appropriate staff should become familiar with the capabilities offered by the available products. Records management applications should comply with DoD Standard 5015.2 *Design Criteria Standard for Electronic Records Management Software Applications*. A listing of electronic document management systems that have been tested and approved by the federal government under the Records Management Application Compliance Testing program can be found at <http://jitc.fhu.disa.mil/recmgt>. The site provides links to the vendor's Web sites and access to a number of guidelines for records management

The brief descriptions below are provided to identify technologies commonly used for data and electronic records management.

Digital Archiving System (DAS)

A digital archiving system is based on the concept of the Open Archival Information System Reference Model (OAIS) and a trusted digital repository. Such a repository provides reliable, long-term access to managed electronic resources to its organization both currently and into the future. It has a framework broad enough to accommodate different situations and architectures, but must prove it is reliable and trustworthy over time. The system creates preservation metadata for digital objects, ingests objects into the digital archive, and retains digital information assets for the long-term. The archiving process involves the analysis, selection, and organization of records produced by a business activity to ensure their authenticity.

Document Imaging Systems (DIS)

Document imaging systems are considered a mature technology. They were introduced in the mid-1980s to replace paper and microfilm-based recordkeeping systems. The system consists of various configurations of hardware and software components used to render paper documents into computer-readable digital images. These images can then be transferred onto a variety of electronic storage media and can be stored, retrieved, and managed electronically. Digital imaging offers many advantages, including: improved distribution and publication, increased access, streamlined workflows, and a greatly reduced need for physical storage space. Text-searchable files can be created by the application of optical character recognition (OCR) software to the images. Most imaging systems use some sort of compression algorithms to reduce image file sizes.

Electronic Document Management Systems (EDMS)

Electronic document management systems are designed to control the life cycle of documents from the point of creation by providing indexing, profiling, routing, check-in and check-out, revision, and version control capabilities at an enterprise level. Through a combination of hardware and software, the systems afford collaboration, distribution, and secure access. The primary concern of electronic document management systems is the authoring and approval process. EDMS solutions may be modular and repository centric and are often integrated with electronic document imaging, full-text retrieval, workflow, and recordkeeping technologies. Such systems can manage dynamic documents, like word processing files as well as static documents, like images of scanned documents. The EDMS runs on a database management system.

Electronic Records Management Systems (ERMS)

Electronic records management systems were originally developed to provide an automated method to manage retention periods for paper-based records. Functional capability has been expanded to collect, organize, categorize, store, retrieve, use, and dispose of electronic files. Metadata is created and tracked. The systems should have both static document and transaction-

capturing capabilities. Basic functionality of ERMSs supports the development of retention schedules, implementation of disposition and retention requirements, calculation of disposal eligibility dates, ability to place holds on disposition when necessary, and generation of disposal logs. ERMSs manage records through their complete life cycle.

E-Mail Archiving System (EAS)

E-mail archiving systems capture and store all e-mail in read-only form. It indexes the e-mail; both sent and received, based on header information. Some systems also provide a full text index of the content of the message and attachments. Captured messages are stored to disk, optical, or tape storage. Single-instance store techniques ensure that only one copy of a message is saved. Data compression techniques may be used for storage efficiency. E-mail archive systems are used by organizations to manage e-mail for compliance, storage management, legal discovery, and knowledge management. Automated solutions for e-mail management have gained in popularity because studies indicate that relying on e-mail users to identify and migrate all critical business e-mails to an organizations' recordkeeping system is risky.

Enterprise Content Management Systems (ECMS)

Enterprise content management systems consist of technologies used to capture, manage, store, preserve, and deliver content across an enterprise. ECM technologies manage an organization's unstructured information, regardless of its physical location. ECM capabilities manage such traditional content types as images, office documents, graphics, drawings, and print streams, as well as such electronic objects as Web pages and content, e-mail, video, and rich media assets, throughout the content's life cycle. Records management capabilities are being added to many ECMSs.

Information Life-Cycle Management Systems (ILMS)

Information life-cycle management systems provide an approach to information and storage management that recognizes that the value of information, based on the data content, changes over time. Information is moved through a continuum of storage mediums to ensure business service-level requirements are met at the lowest unit of cost. Various categories of data are classified according to their importance and business value. Policies are established to migrate the data to different storage media over time. ILM systems are designed to reduce operational costs, achieve compliance, and improve availability by aligning information with business goals and service levels.

Integrated Document Archive and Retrieval Systems (IDARS)

Integrated document archive and retrieval systems provide a consolidated system for storage, access, management, distribution, and data viewing that is print-stream based. IDARS provide customer service support, e-bill presentment, report data distribution and management, and long-term archiving of historical information. Documents reside in a repository that users can access

through a password authentication process. IDARS incorporate computer output to laser disc (COLD), computer output microfiche (COM), and report distribution systems.

Integrated Document Management Systems (IDMS)

Integrated document management systems developed in the mid-1990s through the combination of document imaging, revisable document management, and report management functions. IDMS manage all kinds of documents (images, publications, application files, Web pages, audio and video files, forms, etc.) housed in repositories. IDM solutions manage documents throughout their life cycle and direct processes for creation/input, review/approval, revision, storage, retrieval, distribution, publication, and archiving. Document management is used to streamline workgroup processes, provide secure access to master documents, enhance communications, help teams and remote workers collaborate, and decrease the risk associated with lost documents.

Web Content Management Systems (WCMS)

Web Content Management Systems provide an automated approach to implementing content management processes, controls and policies within a Web site, a Web-based application or a Web-based network. Most major Web content management systems:

- Facilitate production of quality content through simplified authoring tools, workflow tools and templates;
- Increase management control and oversight of the content production process through the use of templates and approval workflows;
- Encourage reuse of content by creating and storing it in neutral formats that can be used for both Web and paper publishing; and
- Increase the integrity of a Web system by producing and maintaining versions for rollback purposes.

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